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OBLON SPIVAK MCCLELLAND MAIER & NEUSTADT PC
FOURTH FLOOR
1755 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202

EXAMINER

MUTSCHLER, BRIAN L

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

1753

10

DATE MAILED: 07/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/890,864

Applicant(s)

HAUSSLER ET AL.

Examiner

Brian L. Mutschler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Comments

1. Applicant's cancellation of claims 1-14 in the Preliminary Amendment received December 21, 2001, is acknowledged.

Information Disclosure Statement

2. The information disclosure statement filed January 2, 2002 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. Specifically, the relevance of EP 0 252 489 has not been supplied.

Specification

3. The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.

- (d) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)
- (e) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (f) BRIEF SUMMARY OF THE INVENTION.
- (g) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (h) DETAILED DESCRIPTION OF THE INVENTION.
- (i) CLAIM OR CLAIMS (commencing on a separate sheet).
- (j) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (k) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

4. The disclosure is objected to because of the following informalities:

In the first paragraph on page 1 and on page 4 at lines 3-8, the reference to the preambles of the claims is inappropriate. The references to the preambles of claims 1 and 10 should be changed to recite the subject matter contained in those claims. This change is necessary because the numbers of the claims can change during the prosecution of the application. In the instant application, claims 1 and 10 have been cancelled.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 16, 18 and 26 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Particularly, it is not clear how a dielectric layer can be used to create an electrode. On page 5 of the instant specification, beginning at line 5, it states "in principle, it is also of little importance whether or not [the refractive layer] is electrically conductive, bearing in mind that it must in no case substantially limit the flow of current between the absorber layer and the window electrode by its ohmic resistance". By definition, a dielectric is a material that does not conduct electricity. Therefore, the specification would not enable one skilled in the art to fabricate the claimed device because it is not clear how electricity passes from the absorber to the electrode when a layer that cannot conduct electricity is interposed between the absorber and the electrode.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 15-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 recites the limitation "an absorber layer, particularly of the CIS type" in line 2. The limitation is indefinite because it is not clear if the absorber has to be of the CIS type or if it can also be of another type. The use of the term "type" also renders the claim indefinite because it is not clear which properties a CIS "type" absorber contains. The same applies to dependent claims 16-23. The Examiner assumed that the absorber was a CIS absorber.

Claim 15 (line 4), claim 25 (line 2) and claim 27 (line 2) recite the limitation a "thin" layer. The term "thin" is a relative term which renders the claim indefinite. The term "thin" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The term "highly refractive" in claim 15 at line 7 is a relative term that renders the claim indefinite. The term "highly refractive" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The phrase is also recited in claims 17, 19, 20, 21, 23, 24, 25 and 27.

Claim 15 recites the limitation "the metallic layer" in line 8. There is insufficient antecedent basis for this limitation in the claim. The phrase also occurs in claims 17, 18, 19, 22 and 23. It is suggested that the phrase "a first metal-base thin layer" in line 4 of claim 15 be changed to "a first metallic layer" to provide a proper antecedent basis for the limitation.

Claim 16 recites the limitation "the dielectric layers" in line 2. There is insufficient antecedent basis for this limitation in the claim. For the purpose of examination, the Examiner assumed "the dielectric layers" referred to the "at least one...oxide or nitride layer" in line 7 of claim 15.

While applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See *In re Hill*, 161 F.2d 367, 73 USPQ 482 (CCPA 1947). The term "dielectric" in claims 16, 18 and 26 is used by the claim to mean "a material that will not substantially limit the flow of current between the absorber layer and the window electrode by its ohmic resistance," while the accepted meaning is "a material that does not conduct electricity, i.e. will substantially limit the flow of current between the absorber layer and the window electrode by its ohmic resistance."

Claim 22 recites the limitation "the metallic layer...particularly a silver layer" in lines 1 and 2. This limitation is indefinite because it is not clear whether the metallic layer is required to be a silver layer. For the purpose of examination, the Examiner has assumed the metallic layer must be a silver layer.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 15-20, 22, 24-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. Pat. No. 4,940,495) in view of Chen et al. (U.S. Pat. No. 5,078,804).

Weber et al. disclose a light transmitting electrically conductive stacked film for use in solar cells. The stacked film **18** comprises a first conductive oxide layer **22** and a second conductive oxide layer **24**, with a metallic film layer **26** interposed between the layers (col. 2, lines 56-66). An optional encapsulant layer **20** maintains a reduced reflection and increased transmission of the solar cell (col. 3, lines 53-55). The conductive oxide layers **22** and **24** are preferably made of ZnO, SnO₂ or TiO₂, and have a high index of refraction (col. 3, line 56 to col. 4, line 1). The metal layer **26** is preferably made of silver (col. 4, lines 16-25). In Example 2, Weber et al. disclose a window electrode having a silver layer with a thickness of 8 nm, and a total thickness of 93 nm (col. 6, lines 56-63). Furthermore, Weber et al. disclose the benefits additional layers to create "an even more efficient top conductive contact", wherein "the multiples of stacked films which may be employed are limited primarily by absorption in the silver and oxide films" (col. 7, lines 8-10 and lines 53-55).

The solar cell of Weber et al. differs from the instant invention because Weber et al. do not disclose the following:

- a. The absorber is a CIS or chalcopyrite layer, as recited in claims 15 and 28;
- b. An antireflective layer on the light-incident side of the window electrode, as recited in claim 15; and

- c. The window electrode comprises a first refractive layer, a first metallic layer, a second refractive layer, a second metallic layer, and an antireflective layer formed in succession, as recited in claim 19.

Regarding claims 15 and 28, Chen et al. disclose the use of an antireflective layer **70** on a solar cell containing a window electrode comprising layers of conductive and refractive zinc oxide layers **50** and metallic layers **60** (fig. 1 and 2). Chen et al. further disclose the use of a CIGS solar cell, a quaternary analog to CIS solar cells (col. 1, lines 53-56).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device of Weber et al. to use an antireflective coating, as taught by Chen et al., because using an antireflective coating increases the amount of sunlight that reaches the semiconductor layer, which increases the photoelectric conversion efficiency.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device of Weber et al. to use a CIS based solar cell, as taught by Chen et al., because CIS and CIGS solar cells have a higher efficiency than silicon solar cells.

Regarding claim 19, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device of Weber et al. to use a second metallic layer between the second refractive layer and the antireflective

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layer because Weber et al. teach that the use of multiple metallic layers result in a more efficient top conductive contact (col. 7, lines 8-10).

The method of making the solar cell having the limitations described above is inherent because the method contains the same limitations recited in the apparatus claims.

11. Claims 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. Pat. No. 4,940,495) in view of Chen et al. (U.S. Pat. No. 5,078,804), as applied above to claims 15-20, 22, 24-26 and 28, and further in view of Nath et al. (U.S. Pat. No. 5,176,758).

Weber et al. and Chen et al. describe a solar cell and method for making the solar cell having the limitations recited in claims 15-20, 22, 24-26 and 28 of the instant invention, as explained above in paragraph 10.

The apparatus and method described by Weber et al. and Chen et al. differ from the instant invention because they do not disclose the formation of a second electrode comprising at least one metallic layer and one refractive layer.

Nath et al. disclose a light-transmissive solar cell comprising transparent electrodes on both sides of the device (col. 2, lines 3-11).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device described by Weber et al. and Chen et al. to use a second transparent electrode similar to the first transparent electrode

because Nath et al. teaches the formation of transparent electrodes on both sides of a solar cell, yielding a device which can absorb light from both sides of the solar cell or transmit light through the cell.

12. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. Pat. No. 4,940,495) in view of Chen et al. (U.S. Pat. No. 5,078,804), as applied above to claims 15-20, 22, 24-26 and 28, and further in view of Yamazaki (U.S. Pat. No. Re. 33,208).

Weber et al. and Chen et al. describe a solar cell and method for making the solar cell having the limitations recited in claims 15-20, 22, 24-26 and 28 of the instant invention, as explained above in paragraph 10.

The apparatus and method described by Weber et al. and Chen et al. differ from the instant invention because they do not disclose a blocking layer between the metallic layer and the refractive layer.

Yamazaki discloses the use of a blocking layer as a means for preventing impurities from entering the active regions of the solar cell (col. 4, line 18).

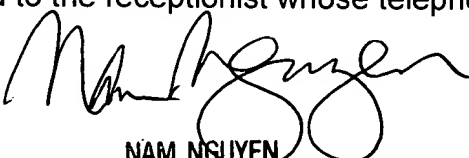
It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the device described by Weber et al. and Chen et al. to use a blocking layer, as taught by Yamazaki, because using a blocking layer would prevent impurities from reaching the active regions of the solar cell.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703) 305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

blm
June 27, 2002